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AIR POLLUTION IN VISAKHAPATNAM - AN OVERVIEW

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ABSTRACT

The study of air pollution causes, sources, pollutants, adverse effects on environment, precautionary measures, and mitigation measures can all be comprehensively studied customized air pollution modeling software and productive inferences can be drawn from the results which will again become inputs for the model. Thus we have refined results. Careful modeling of air pollution by experts is very important especially in the urban areas because it has a huge impact on the sustainable development and ecological balance. In this paper air pollution growing scenario of Visakhapatnam and mitigation measures to be taken are discussed.

KEYWORDS: Air Pollution, Ambient Air Quality, Mitigation Measures, Visakhapatnam

INTRODUCTION

Visakhapatnam is growing fast into a metropolitan area. The city houses an efficient IT Hub, with a lot of industries, day-by-day increasing traffic, and has a population of 17, 30,320 as per the census of 2011. It has also got a huge residential potential. The advancements of the city though are desirable should progress in a sustainable manner. The lack of proper planning may lead to unsustainable development which is extremely undesirable for the budding generations. The air pollution caused by the uncontrolled and above threshold industrial emissions, municipal waste incineration, vehicular traffic etc. cause drastic degradation of quality and instability of environmental parameters. These parameters have to be stabilized and improved by proper protection measures.

CEPI's RATING OF VISAKHAPATNAM

According to the CPCB's Comprehensive Environmental Pollution Index (CEPI), review by MoE&F Visakhapatnam is one of the Critically Polluted Areas. Visakhapatnam can be referred to as bowl area with regards to environmental impact assessment as it is surrounded by hill ranges (Eastern Ghats) on three sides and on the other side. So inversion conditions due to negative adiabatic lapse rate are common here.

Due to various industries like petroleum refineries, steel, zinc, and fertilizer plants, polymer, cement factories, dairies there is a drastic deterioration of air, water quality. The age old manufacturing equipment and processes have to be replaced by advanced sustainable technologies and machines. The significant cause of concern is the co-existence of the important habitats in and around these industrial sectors. These reasons put Visakhapatnam on the map of potentially polluted and pollution potential areas.

The major pollutants of concern are SPM, SO2, NOX which have reached the critical level and rapidly going beyond threshold (bearable limit). Ground water is contaminated by high concentration of fluoride, nitrate, and zinc which cause fluorosis, Methemoglobinemia (blue babies), and Ataxia respectively. Another major threat is posed by mismanagement and improper disposal of municipal and industrial solid wastes and hazardous waste. The industrial emissions have a combined deteriorating effect on the health and well being of the local communities, and the weaker sections are more prone to these adverse impacts.

CPCB's POINT OF VIEW OF VISAKHAPATNAM POLLUTION

Visakhapatnam is one of the nonattainment cities (violating NAAQS) as listed by CPCB. The pollutants of major concern are Suspended particulate matter (SPM) and Respirable Suspended Particulate Matter (RSPM) and the major sources of pollution are vehicles and industries. The emissions from the rapidly rising vehicular population in the Visakhapatnam urban areas are polluting the atmospheric air and cause an intolerable, undesirable and alarming rise in the levels of RSPM (Respiratory Suspended Particulate Matter, less than 10 microns). As the vehicular population (single major cause for RSPM) is continuously on the go, it's a technically advanced job to monitor and model such pollution. According to National Ambient Air Quality Standards (NAAQS) set by CPCB, the standard for concentration of RSPM in ambient air (24 hours) of industrial areas is 150 µg/m3; of residential, rural and other areas is 100 µg/m3; and in sensitive areas is 75 µg/m3.

The annual average values of these are respectively 120, 60, and 50 µg/m3. The exceedence factor In the residential areas of urban Visakhapatnam, the RSPM levels are classified as high 'H' i.e. exceeded NAAQS annual average by an exceedence factor of 1.0 - 1.5 at almost all the locations and in the industrial areas it is moderate (exceedence factor of 0.5-1). The SPM level in the residential areas of Visakhapatnam is high. The NO2 level in the residential areas is Moderate. This is a terrible situation which has to be ameliorated with immediate effect. The rapidly increasing vehicular pollution is also adversely affecting the phytoplankton of the water bodies and Bay of Bengal, so the composition of the surface waters is badly affected which is very undesirable. This has a significant negative impact on the biogeochemistry of the region. CO2 released by vehicles and industries is absorbed by the ocean surface causing ocean acidification. Between 65% and 80RF% of CO2 released into the air dissolves into the ocean over a period of 20–200 years!

AIR PREVENTION AND CONTROL OF POLLUTION ACT, 1981

According to the Air Prevention and Control of Pollution Act, 1981, an "air pollutant" means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment; here it is significant to note that noise is also included in the definition. The Act is intended to take appropriate steps for the preservation of the natural resources of the earth which, among other things, include the preservation of the quality of air and control of air pollution. Under this act there are certain approved appliances and fuels. Usage of unapproved appliances and fuels is an offence.

According to this act "chimney" includes any structure with an opening or outlet from or through which any air pollutant may be emitted; "control equipment" means any apparatus, device, equipment or system to control the quality and manner of emission of any air pollutant and includes any device used for securing the efficient operation of any industrial plant; "emission" means any solid or liquid or gaseous substance coming out of any chimney, duct or flue or any other outlet; "industrial plant" means any plant used for any industrial or trade purposes and emitting any air pollutant into the atmosphere.

According to CPCB there should be a comprehensive program in place for the prevention, control and abatement of air pollution, thus ameliorating the quality of the ambient air. It is important to note that the CPCB also collects, compiles and publishes technical and statistical data relating to air pollution and the measures devised for its effective prevention, control or abatement and prepare manuals, codes or guides relating to prevention, control or abatement of air pollution;It also lays down standards for the quality of air. Also the Central Board may establish or recognize a laboratory or laboratories to enable the Central Board to perform its functions efficiently.

NATIONAL AIR QUALITY MONITORING PROGRAM (NAMP)

The National Air Quality Monitoring Program (NAMP) is CPCB's innovative program to monitor the ambient air quality in India. NAMP network consists of three hundred and forty two (342) operating stations covering one hundred and twenty seven (127) cities/towns in twenty six (26) states and four (4) Union Territories of the country. This program also takes care of preventive and corrective measures to control air pollution by identifying the critically polluted areas. NAMP identified four air pollutants i.e., Sulphur Dioxide (SO2), Oxides of Nitrogen as NO2, Suspended Particulate Matter (SPM) and Respirable Suspended Particulate Matter (RSPM / PM10) for regular monitoring at all the locations under its ambit and also integrated with the monitoring of meteorological parameters like wind speed and wind direction, relative humidity (RH) and temperature.

By using a wind rose diagram the wind direction, duration and intensity can be known. Relative humidity can be measured by using psychrometer (an instrument that uses the difference in readings between two thermometers, one having a wet bulb and the other having a dry bulb, to measure the moisture content or relative humidity of air) or advanced equipment like hand held instruments, meters, data recorders, data loggers, and analyzers with electronic sensors. Temperature can be measured with thermometers, thermistors, resistance thermometers or resistance temperature detectors, pyrometers, infrared (IR) sensors etc. The monitoring of pollutants is carried out for 24 hours (4-hourly sampling for gaseous pollutants and 8-hourly sampling for particulate matter) with a frequency of twice a week, to have one hundred and four (104) observations in a year. The monitoring is being carried out with the help of Central Pollution Control Board; State Pollution Control Boards; Pollution Control Committees; National Environmental Engineering Research Institute (NEERI), Nagpur. CPCB co-ordinates with these agencies to ensure the uniformity, consistency of air quality data and provides technical and financial support to them for operating the monitoring stations. N.A.M.P. is being operated through various monitoring agencies. Large number of personnel and equipments are involved in the sampling, chemical analyses, data reporting etc. It increases the probability of variation and personnel biases reflecting in the data, hence it is pertinent to mention that these data be treated as indicative rather than absolute. (**Source**: http://www.cpcb.nic.in/)

ENVIRONMNETAL INFORMATION SYSTEM (ENVIS)

The Environmental Information System (ENVIS) is started in December 1982 by CPCB (MoEF). ENVIS provides valuable information of the environment (parameters etc.) to the policy makers, scientists, engineers, teachers, and research scholars. As environment is a multidisciplinary subject, ENVIS developed a comprehensive environmental information system by a strong network of pertinent institutions and organizations (nodes or ENVIS centers). ENVIS due to its comprehensive network has been designed as the National Focal Point (NFP) for INFOTERRA, a global environmental information network of the United Nations Environment Programme (UNEP). In order to strengthen the information activities of the NFP, ENVIS was designated as the Regional Service Centre (RSC) of INFOTERRA of UNEP in 1985 for the South Asia Sub-Region countries.

US EPA's CLASSIFICATION OF STANDARDS

According to US EPA air quality standards are of two types: Primary and Secondary. If the quality exceeds primary standards, adverse health effects are caused. If the quality exceeds secondary standards, vegetation and structures get damaged (well being effects). As different air-pollutants have different effects, the ambient air quality standards are also different. Certain pollutants have both long-term (chronic health effects) and short-term standards (acute health effects). There are six 'criteria' pollutants for which National Ambient Air Quality Standards (NAAQS) have been set by EPA. They are Carbon Monoxide (CO), Lead, Nitrogen Dioxide (NO2), Ozone (O3), SPM, and Sulphur

Dioxide (SO2). The Menu of Control Measures (MCM) which is like a 'living' document which can be updated with the current or newly available data.

MITIGATING MEASURES

In the areas where the ambient air quality is poorer than the upper limits set, programs to ameliorate the air quality have to be undertaken. Similarly in the areas with moderate air quality, programs to safeguard the ambient air quality have to be taken. For this there has to be an advanced and efficient air quality monitoring system in place and it has to be continuously upgraded. This is an effective means by which the present ambient air quality can be compared to the air quality standards set by the pollution control boards or agencies and to the already monitored past information. There is an urgent need for an advanced and customized sewerage system and sewage treatment plants in Visakhapatnam. The clusters of people around industrial area of Visakhapatnam have to be relocated to environmentally safe places. There is an urgent requirement for faster, event-driven, real time remote network of air quality monitoring and micrometeorological stations in place based on air pollution potential studies like spatial modeling using GIS.

Adequate number of mobile air pollution vehicles, equipped with advanced air pollution monitoring equipment, has to be acquired. Advanced fixed and portable gas, particulate detection equipment etc. has to be purchased. This equipment have to be integrated seamlessly with advanced digital data acquisition using digital instrument interfaces capable of transition of monitoring operations to analyze, model, interpret, and apply the mitigation measures for air pollution. The proper analysis of this air pollution monitoring data acts as an effective tool in the interpretation of adverse effects of the air pollutants on the Eco-systems especially humans and thus can be used for trace-monitoring as well as stack-monitoring to evaluate the effects of air pollution causing sources in comparison with threshold levels.

CONCLUSIONS

Air quality improvement program's and climate protection policies are mutually dependent and symbiotic, and beneficial to the environment, ecosystems and hence to human beings. Air pollution and climate change (which includes global warming, El Niño, La Niña) influence each other by complex interactions in the atmosphere and hence have repercussions for each other. The Green House Gases (GHGs) are responsible for climate change because they have long life time. Air pollutants are the causative of adverse impacts on human health, ecosystems and the climate. Hence the pollution control strategies should include the abatement technologies of both CHGs and other major air pollutants.

The earth-atmosphere energy balance is the balance between incoming energy from the Sun (ultraviolet, shortwave radiation) and outgoing energy from the mother Earth (Infrared, long wave radiation). This is achieved as the energy received from the Sun is balanced by the energy emitted by our earth and its atmosphere back to space. So a stable average temperature and hence a stable climate is maintained by our mother Earth. The atmosphere is our protective shield. Along with Nitrogen (N2, 78.084%), Oxygen (O2, 20.947%), Argon (Ar, 0.934%), Carbon dioxide (CO2, 0.033%) which forms 99.998% of the atmospheric gases, water vapour is also a common constituent of our Earth's atmosphere which can be up to 3% on extremely hot and humid days, 4% being the upper limit in the tropical regions or climates.

REFERENCES

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